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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
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EXAMINER

GUERRERO, MARIA F

ART UNIT PAPER NUMBER

2822

DATE MAILED: 07/15/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/899,627

Applicant(s)

LEE ET AL.

Examiner

Maria Guerrero

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 21 June 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 12-26 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 12-26 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

1. This Office Action is in response to the Amendment filed May 26, 2004 and the Request for continued examination filed June 21, 2004.

Claims 1-11 and 27 are canceled.

Claims 12-26 are pending.

Continued Examination Under 37 CFR 1.114

2. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on June 21, 2004 has been entered.

Priority

3. Applicant cannot rely upon the foreign priority papers to overcome this rejection because a translation of said papers has not been made of record in accordance with 37 CFR 1.55. See MPEP § 201.15.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 12, 16, and 18-26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kaufman et al. (U.S. 6,063,306) in view of Chan et al. (U.S. 6,495,200) and Sun et al. (U.S. 2003/0022801).
5. Kaufman et al. teaches forming a barrier layer (adhesive layer) along a stepped portion over the surface of an interdielectric layer having a recessed region (trench region and contact holes) (col. 1, lines 5-20, 25-65). Kaufman et al. shows exposing the barrier layer by chemical mechanical polishing using a solution comprising an oxidizing agent, a pH controlling agent, a chelate reagent, and water (col. 3, lines 40-48, 60-67, col. 4, lines 1-5, 57-65, col. 5, lines 5-65, col. 6, lines 3-55, col. 7, lines 13-20).
6. Furthermore, Kaufman et al. discloses oxidizing agent being hydrogen peroxide or an oxidizing agent of an ammonium series (col. 5, lines 5-30). Kaufman et al. shows the oxidizing agent from the ferric series as conventional use in the art (col. 2, lines 35-40). Kaufman et al. teaches the oxidizing agent being in a range of 0.01% to 3.0% by weight or 0.3% to about 17% by weight, the chelate reagent (benzotriazole (BTA)) being in a range of 0.01 to about 1% by weight (col. 3, lines 40-48, col. 5, lines 30-37, col. 6, lines 24-40). Kaufman et al. teaches controlling the pH using an acid (nitric acid) or a

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basic solution (ammonium hydroxide) and the pH being from about 2.0 to about 12.0 (col. 7, lines 12-22). Kaufman et al. discloses as conventional in the art the slurry comprising a chemically reactive solution (col. 2). Kaufman et al. teaches the solution having non-abrasive components (col. 10, lines 65-67, col. 11, lines 1-5).

7. Kaufman et al. does not specifically show forming a copper seed layer on the barrier layer. However, Kaufman et al. discloses forming a copper film on the barrier layer (col. 3, lines 60-67). Chan et al. shows the formation of the seed layer before forming a copper film as well known in the art (Fig. 1A-1D, col. 2, lines 10-32).

8. Kaufman et al. does not specifically show the exposing step does not include the use of an abrasive. However, Sun et al. discloses using an abrasive-free solution (paragraph 0048).

9. Therefore, it would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Kaufman et al. reference by including the conventional seed layer as taught Chan et al. and the abrasive-free solution as taught by Sun et al. to avoid dishing and erosion problems.

10. Claims 12-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Aoki et al. (U.S. 6,524,376) in view of Sun et al. (U.S. 2003/0022801).

11. Aoki et al. teaches forming a barrier layer (adhesive layer) along a stepped portion over the surface of an interdielectric layer having a recessed region (trench region and contact holes) (Fig. 1A, 8A, 10C, col. 14, lines 35-44). Aoki et al. discloses

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forming a copper seed layer by sputtering (physical vapor deposition) on the barrier layer (col. 14, lines 40-47).

12. In addition, Aoki et al. shows exposing the barrier layer by chemical mechanical polishing using a solution comprising an oxidizing agent (hydrogen peroxide), a pH controlling agent, a chelate reagent, and water (col. 8, lines 20-50, col. 9, lines 1-11, col. 10, lines 10-15, col. 14, lines 50-65). Aoki et al. teaches the copper seed layer remaining only within the recessed region (Fig. 8B). Aoki et al. teaches preparing a solution without abrasives and adding the abrasives to form the slurry; therefore, the solution does not contain abrasives (col. 8, lines 20-43).

13. Furthermore, Aoki et al. shows forming a copper layer on the copper seed layer, the copper layer, the copper seed layer, and the barrier layer projecting in order above the surface of the interdielectric layer (Fig. 8A). Aoki et al. teaches planarizing the copper layer, the copper seed layer, and the barrier to form a copper interconnection layer (Fig. 8B, col. 13, lines 1-10).

14. Aoki et al. does not specifically show that the exposing step does not include the use of an abrasive. However, Sun et al. discloses using an abrasive-free solution (paragraph 0048).

15. Therefore, it would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Aoki et al. reference by including the use of the abrasive-free solution as taught by Sun et al. to avoid dishing.

Double Patenting

The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and, *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

16. Claims 12, 14-15, and 17 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-6 of U.S.

Patent No. 6,610,596 in view of Kaufman et al. (U.S. 6,063,306) and Chan et al. (U.S. 6,495,200). Claims 1-6 of U.S. Patent No. 6,610,596 recites all the limitations of claims 12, 14-15, and 17, except for the copper seed layer and the solution comprising an oxidizing agent, a pH controlling agent, a chelate reagent, and water. However, Chan et al. shows the formation of the seed layer before forming a copper film as well known in the art (Fig. 1A-1D, col. 2, lines 10-32). Kaufman et al. shows exposing the barrier layer by chemical mechanical polishing using a solution comprising an oxidizing agent, a pH controlling agent, a chelate reagent, and water (col. 3, lines 40-48, 60-67, col. 4, lines 1-5, 57-65, col. 5, lines 5-65, col. 6, lines 3-55, col. 7, lines 13-20).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time of the invention to include the recitation of the copper seed layer and the solution comprising an oxidizing agent, a pH controlling agent, a chelate reagent, and water as suggested by Kaufman et al. and Chan et al. because is conventional employed in the art.

Response to Arguments

17. Applicant's arguments with respect to claims 12-26 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

18. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Maria Guerrero whose telephone number is 571-272-1837.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Amir Zarabian can be reached on 571-272-1852. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Maria Guerrero
Maria Guerrero
Primary Examiner
July 12, 2004